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n-tuple groupoids and optimally coupled factorizations

The equivalence between factorizations of groupoids into two factors and vacant double groupoids has been known for quite some time and carries to smash products of Hopf algebras for the $\mathbb{K}$-linear case, as shown in Majid's book [1], Natale and Andruskiewitsch [2] or more recently in Mackenzie's article [3]. Natale and Andruskiewitsch give a complete description of the structure of double groupoids and their relations to factorizations of groupoids by 2 factors in [4].

In a short note [5], Brown speculated on a generalization to triple groups and matched triples of groups. This talk is meant to clarify these speculations as it will do two things: generalize the equivalence to the non slim case and extend it to n-tuple groupoids for any dimension n.

References

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